Geostationary Operational Environmental Satellite (GOES)

GOES-R Series

Geostationary Lightning Mapper (GLM)

Unique Instrument Interface Document (UIID)

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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

Table of Contents

GLMUIID1	1	**1 Scope**
GLMUIID2	1.0-1	The purpose of this Unique Instrument Interface Document (UIID) is two-fold. The first is to allocate GOES-R series spacecraft resources to the Geostationary Lightning Mapper (GLM). The second is to serve as a core building block on which the GLM-spacecraft interface can be designed.
GLMUIID3	1.0-2	The spacecraft integrating contractor and the GLM contractor **shall** meet each of their respective interface requirements as defined in this document.
GLMUIID4	1.0-3	The Government will be the system integrator until a system performance contractor or spacecraft contractor with that responsibility is selected. Until that time, the Government will be responsible for accommodation trades, resource allocation (weight, power, space, bandwidth, etc.), and resolving interface issues. This UIID will govern the development of an Interface Control Document (ICD) which will be a joint activity of the GLM and spacecraft contractors.
GLMUIID5	1.0-4	The GLM ICD establishes the details of the electrical, communications, mechanical, thermal, integration and test, and command and data handling (C&DH) interfaces between the GLM instrument and the GOES-R spacecraft.
GLMUIID6	1.0-5	After the ICD is signed and approved by all parties, the spacecraft contractor **shall** maintain the ICD.
GLMUIID7	1.0-6	The GLM is a single-wavelength, non-scanning imaging instrument designed to detect lightning. The instruments collect data on a three-axis body-stabilized satellite in geosynchronous orbit. Probability of detection and false alarm, coverage, resolution and geolocation accuracy are prime requirements of the system. The instrument requires primary power and command input data from the spacecraft. Instrument output data to the spacecraft contains instrument information, instrument telemetry and ancillary data. The sensor units contain the optical system, detectors and their cooling systems, if required, and directly related electronics. The electronics unit contains the power supply module, command, control, and data processing circuitry.

GLMUIID8	1.1	1.1 Document Overview
GLMUIID9	1.1.0-1	Together, the General Interface Requirements Document (GIRD) and the GLM UIID establish the GLM-spacecraft interface requirements. The GIRD applies to all GOES-R instruments while the GLM UIID is specific to the GLM. Section 1 explains the use of this document. Section 2 lists reference documents. Section 3 allocates spacecraft resources, such as mass, power, and data rate, to the GLM instrument. Section 4 contains government-accepted operation constraints. Section 5 contains government-accepted deviations from the GIRD. Section 6 contains a list of acronyms used within this document.
GLMUIID10	1.2	1.2 Missing Requirements
GLMUIID11	1.2.0-1	This document contains all performance requirements for the sensor except those labeled "TBD," "TBS," and "TBR". The term "TBD," meaning "to be determined," applied to a missing requirement means that the contractor should determine the missing requirement in coordination with the government. The term "TBS," meaning "to be specified," indicates that the government will supply the missing information in the course of the contract. The term "TBR," meaning "to be reviewed," implies that the requirement is subject to review for appropriateness by the contractor or the government. The government may change "TBR" requirements in the course of the contract.
GLMUIID12	1.3	1.3 Order of Precedence
GLMUIID13	1.3.0-1	The order of precedence of interface requirements documents is the UIID at the highest level, followed in order by the GIRD, ICD, and Instrument Description Document (IDD).
GLMUIID14	2	**2 Applicable Documents**
GLMUIID15	2.0-1	Reserve
GLMUIID16	3	**3 Allocations**
GLMUIID17	3.0-1	The GOES-R spacecraft provides communications, power and a platform for the GLM instrument. The following paragraphs allocate these resources to GLM.

GLMUIID18	3.1	3.1 Command and Data Handling
GLMUIID19	3.1.1	3.1.1 Instrument-to-Spacecraft Science Rate
GLMUIID20	3.1.1.0-1	The instrument science and engineering data rate, including all overhead associated with Consultative Committee for Space Data Systems (CCSDS) packetization by the instrument, at the spacecraft interface **shall** not exceed 400 kilo (10^3) bits per second when averaged over any 5 second period.
GLMUIID21	3.1.2	3.1.2 Telemetry Data Rate
GLMUIID22	3.1.2.0-1	Housekeeping telemetry data rate, including all overhead associated with CCSDS packetization by the instrument, at the spacecraft interface **shall** not exceed 1024 bits per second when averaged over any 5 second period.
GLMUIID23	3.1.3	3.1.3 Application Process Identifiers
GLMUIID24	3.1.3.0-1	The GLM **shall** use no more than 255 consecutive Application Process Identifiers (APIDs) for science, telemetry, and command packets.
GLMUIID25	3.2	3.2 Power
GLMUIID26	3.2.1	3.2.1 Average Power
GLMUIID27	3.2.1.0-1	The GLM **shall** draw operational power of no more than 260 watts averaged over 5 minutes.
GLMUIID28	3.2.2	3.2.2 Peak Power
GLMUIID29	3.2.2.0-1	The GLM **shall** draw operational power of no more than 325 watts peak power.
GLMUIID30	3.2.3	3.2.3 Survival Power
GLMUIID31	3.2.3.0-1	The GLM **shall** require no more than 195 watts survival power to maintain survival temperatures.
GLMUIID32	3.3	3.3 Mechanical
GLMUIID33	3.3.0-1	The requirements in this section apply to the structural and mechanical components of the instrument flight units (sensor unit, electronics unit and, if applicable, auxiliary electronics unit).

GLMUIID34 3.3.1 3.3.1 Mass Properties

GLMUIID35 3.3.1.0-1 The GLM, including all units and cabling between units, **shall** have mass less than *65* kilograms.

GLMUIID36 3.3.2 3.3.2 Cabling Between Units

GLMUIID37 3.3.2.0-1 If there are external units mounted directly to the spacecraft, the GLM **shall** accommodate any cable length between the units up to but not exceeding the lengths defined in the following table:

Item	**Unit Cable Connections**	**Length** (m)
1	Electronics to sensor	2.5
2	Auxiliary electronics to sensor	2.5

GLMUIID51 3.3.2.0-2 Cables between GLM units will be the responsibility of the GLM contractor.

GLMUIID52 3.3.3 3.3.3 Volume

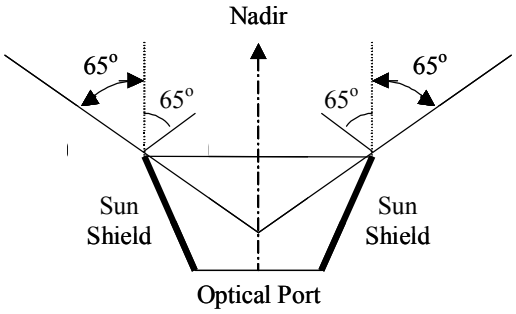
GLMUIID53 3.3.3.0-1 The GLM sensor and electronics units, including mounts, thermal blankets and connectors for both stowed and operational configurations, **shall** have dimensions that do not exceed the limits listed in the Instrument Unit Envelopes table.

Instrument Module Envelopes Table

Component	Width (cm) (X)	Height (cm) (Y)	Depth (cm) (Z)
Sensor unit*	40.0	40.0	75.0
Auxiliary Electronics	50.0	50.0	37.5

*Discussion: For the sensor unit only, width is in the X direction of the body reference frame (BRF) defined in the GIRD. Height is measured in the Y direction of the BRF, and depth is in the Z direction of the BRF. For the electronic units, height is the direction normal to the mechanical interface plane.

GLMUIID55	3.3.4	3.3.4 Optical Port Field-of-View
GLMUIID56	3.3.4.0-1	The spacecraft **shall** provide the sensor unit's optical port a clear field-of-view within 65° of nadir as shown in the following figure.



GLMUIID58	3.3.5	3.3.5 North Field-of-View
GLMUIID59	3.3.5.0-1	The spacecraft **shall** provide the sensor unit's +Y face a 2 π steradian clear field-of-view to space. The -Y axis is in the Body Reference Frame (BRF) defined in the GIRD.
GLMUIID60	3.3.6	3.3.6 Reserved
GLMUIID61	3.3.7	3.3.7 Reserved
GLMUIID67	3.3.8	3.3.8 Mounting
GLMUIID68	3.3.8.0-1	The spacecraft **shall** provide the instrument sensor unit a nadir-facing mounting surface.
GLMUIID69	3.3.8.0-2	The spacecraft mounting surface **shall** have as a minimum the same dimensions of the sensor unit envelope anti-nadir plane.
GLMUIID70	3.3.8.0-3	The sensor unit mechanical interface **shall** lie within the anti-nadir plane of the sensor unit envelope.
GLMUIID71	3.3.8.0-4	The instrument sensor unit **shall** use kinematic mounts for its mechanical interface to the spacecraft in the event that moving components are employed as part of sensor normal operation.
GLMUIID72	3.4	3.4 Reserved
GLMUIID73	3.5	3.5 Thermal
GLMUIID74	3.5.0-1	The instrument electronics module and auxiliary electronics module total heat transfer to the spacecraft **shall** not exceed 200 Watts.

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4 Constraints

GLMUIID76 4.0-1

In order to ensure proper instrument performance or to prevent possible instrument damage, the following Government-approved constraints are imposed by the instrument developer on spacecraft integration and test activities, including launch, activation and operations.

No constraints have been identified at this time.

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5 GIRD Deviations

GLMUIID78 5.0-1

This section identifies GIRD requirements that the Government has deviated from for this instrument. Where appropriate, corresponding GIRD paragraph titles and numbers are identified in parentheses.

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6 Acronyms

GLMUIID80 6.0-1

APID	Application Process Identifier
C&DH	Command and Data Handling
CCSDS	Consultative Committee for Space Data Systems
GIRD	General Interface Requirements Document
GLM	Geostationary Lightning Mapper
GOES	Geostationary Operational Environmental Satellite
GSFC	Goddard Space Flight Center
ICD	Interface Control Document
IDD	Instrument Description Document
NASA	National Aeronautics and Space Administration
PORD	Performance and Operational Requirements Document
TBD	to be determined
TBR	to be resolved
TBS	to be specified
UIID	Unique Instrument Interface Document